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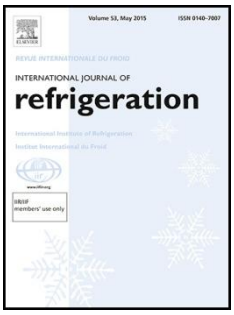

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Author: F.W. Yu, W.T. Ho, K.T. Chan, R.K.Y. Sit

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Logistic regression-based optimal control for air-cooled chiller

F.W. Yu[1,*], W.T. Ho[1], K.T. Chan[2], R.K.Y. Sit[1]

[1] *Hong Kong Community College, The Hong Kong Polytechnic University, Hong Kong, China*
[2]*Department of Building Services Engineering, The Hong Kong Polytechnic University, Hong Kong, China*

Highlights:

- Air-cooled chiller models were developed by random forest.
- Optimal settings were identified by genetic algorithm.
- Logistic regression ascertained when to lower the set point of condensing temperature.
- The COP increased by up to 110% and 67% in normal and VSD modes under optimization.

Abstract

Air-cooled chillers normally operate under head pressure control without minimizing the electric power at part load operation. This study considers logistic regression to implement optimal control for an air-cooled chiller. Random forest models were developed for the chiller operating under two modes: the normal mode—switching on and off condenser fans at constant speed based on a fixed condensing temperature set point; the VSD mode—controlling all condenser fans at variable speed based on an adjustable set point instead. Genetic algorithm was then applied to simulate the maximum coefficient of performance (COP) with optimal operating variables. The COP at a low chiller load could increase by up to 110% and 67% in the normal and VSD modes, respectively. Logistic regression ascertained that the optimal control depended highly on the condensing temperature and the condenser airflow rate. The regression models served to adjust the condensing temperature set point to achieve maximum COP.

Keywords: Air-cooled chiller; genetic algorithm; logistic regression; random forest; variable speed control

[*] Corresponding author. Tel.: +852 37460416; fax: +852 23647375.
E-mail address: ccyufw@hkcc-polyu.edu.hk (F.W. Yu).